C-A OPERATIONS PROCEDURES MANUAL

13.6.3 Programmable Device/Assembly Documentation Procedure

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Collider-Accelerator Department Chairman   Date

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13.6.3 Programmable Device/Assembly Documentation Procedure

1. Purpose

1.1 This OPM describes the procedure for documenting programmable devices and programmable assemblies. All programmable device or assemblies shall use this procedure to document archiving of design files, providing instructions for programming the devices or assemblies, and revision control.

1.2 Definitions

1.2.1 Programmable Devices
Programmable devices are defined as components that are programmed **prior** to assembly onto a higher level assembly, such as:
- Module identification proms (ID Proms);
- Gate arrays;
- Microcontrollers with program stored in microcontroller

1.2.2 Programmable assemblies

Programmable assemblies are defined as hardware assemblies that are programmed after manufacture but prior to use. This includes, but is not limited to:
- Memory devices that holds configuration data for SRAM based gate array(s).
- Microprocessor program loaded into flash memory.
- PLCs
- Firmware

2. Responsibilities

Documentation Control personnel shall assign and properly log official drawing numbers

3. Prerequisites

None

4. Precautions

Electrostatic Discharge (ESD) practices as necessary.

5. **Procedure**

5.1   Programmable device

5.1.1   Each programmable device shall be assigned a drawing number and revision letter. Documentation Control personnel shall assign drawing numbers. Each programmable device drawing shall include, if applicable:

- Reference to the location of the source file, which contains logic equations, state descriptions or graphic files used to develop the project. All source files shall include detailed comments as to the purpose and function of the programmable device. Changes to the source file shall be detailed and included in these comments.
- Library symbols and include files used to create the project.
- Simulation files created during the design phase.
- The programming file used to create the device.
- The name and revision of the software package used to generate the programming file.
- Other characteristics such as the operating system and version, programming language if applicable.
- A brief description of functionality.
- The manufacturer part number of the target device.
- All pertinent file generation instructions.
- Detailed instructions needed to load software into the target device; and
- Acceptance requirements in the form of a test procedure or checksum.
- Labeling instructions.

5.1.2   The following diagram tree illustrates how a device programmed prior to assembly is identified.

Programmable Device Diagram Tree
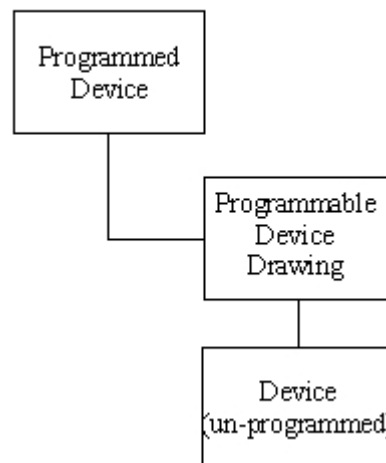
5.1.3 Drawing requirements: The Programmable Device drawing fields (see Fig 1) shall be completed as listed below.

1. Drawing Title – assigned by Engineer.
2. Drawing Number - assigned by Document Control Center.
3. Revision – Initial revision is A. The current revision level of drawing can be obtained from the Documentation Control Center personnel.
4. Signatures – obtained by the Electrical Design Group.
5. Used On – Not Applicable.
6. Description of Programmable device – assigned by Engineer.
7. Manufacturer part number – assigned by Engineer.
8. Label Information - Each Programmable device shall be marked per MIL-STD-130 with the following information: Drawing number, function (e.g., address decoder, frame detector, etc.), revision letter, and checksum, identified by Engineer.
9. Revision Block – lists ECN numbers and revision level after drawing release, updated by Electrical Design Group.

Fig 1.

5.1.4 Schematics must identify all Programmable devices with an official drawing number as identification for the device. The manufacturer part number may be added to the component as reference and be placed in parenthesis.
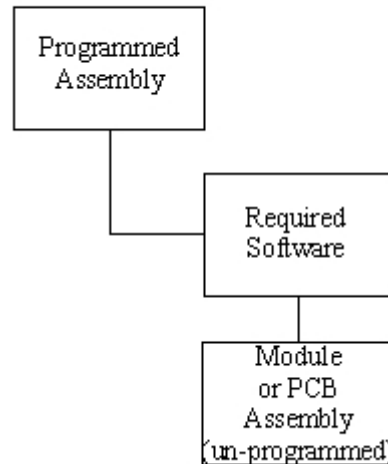
5.2 Programmable assemblies

5.2.1 Each programmed assembly shall be assigned a drawing number and revision letter. Documentation Control personnel shall assign drawing numbers. Each programmable assembly instruction drawing shall include, if applicable:

- Reference to the location of the source file, which contains logic equations or state descriptions used to develop the project. All source files shall include detailed comments as to the purpose and function of the programmable assembly. Changes to the source file shall be detailed and included in these comments.
- Library symbols and include files used in the creation of the object file.
- Simulation files created during the design phase.
- The name and revision of the software package used to generate the programming file.
- Other characteristics such as the operating system and version, programming language if applicable.
- A brief description of functionality.
- A manufacturer part number of the target device.
- All pertinent file generation instructions.
- Detailed instructions needed to load software into the target device; and
- Acceptance requirements in the form of a test procedure or checksum.
- Labeling instructions.

5.2.2 The following block diagram illustrates how a programmed PCB assembly gets identified.

Programmed Assembly Diagram Tree

```
┌──────────────┐
│ Programmed   │
│ Assembly     │
└──────┬───────┘
       │
       │     ┌──────────────┐
       └─────┤ Required     │
             │ Software     │
             └──────┬───────┘
                    │
                    │   ┌──────────────┐
                    └───┤ Module       │
                        │ or PCB       │
                        │ Assembly     │
                        │(un-programmed)│
                        └──────────────┘
```

5.2.3   Drawing requirements: The Programmed Assembly Drawing (example: Fig 2) shall be completed in the following fields as listed below.

1. Drawing Title – assigned by Engineer.
2. Drawing Number - assigned by Document Control Center (rd or released)
3. Revision – Initial revision is A. The current revision level of drawing can be obtained from the documentation control center personnel.
4. Signatures – obtained by the Electrical Design Group.
5. Used On – Not applicable.
6. Label Information – A label (non conductive, constructed with permanent adhesive, and marked using permanent ink) per MIL-STD-130 shall be adhered to the un-programmed Printed Circuit Assembly marked with the drawing number and revision of the Programmed Assembly Drawing. This identifies the PCB Assembly as a programmed assembly.

Note:

If the assembly can be downloaded remotely, and the revision can be identified remotely, then the revision may be omitted from the label, identified by engineer.

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7. Software Installation Instructions – all pertinent information necessary to define the characteristics of the software, instructions for programming into a memory device, its master media, and physical location, assigned by engineer.
8. Revision Block – lists ECN numbers and revision level after drawing release, updated by Electrical Design Group.

NOTES:
1. INTERPRET DWG IAW ASME Y14.100
2. REFER TO PROGRAMMABLE DEVICE PROCEDURE C-A-OPM 13.6.3
3. LOCATION OF THE SOURCE FILE AND OBJECT FILE IS: ELECTRICAL SYSTEMS DESIGN GROUP
4. ALL ITEMS LISTED WITH PART NUMBER AND MANUFACTURER CAN BE SUBSTITUTED WITH A BNL APPROVED EQUIVALENT PART.
5. LABEL IS MARKED AS FOLLOWS:
   DRAWING NO._____
   REVISION_____

DWG NO   2   SHT   OF   3 REV

REVISIONS

REV	ZONE	ECN NO.	DESCRIPTION	BY	DATE	CKR	APP

DRAWING NUMBER OF ASSEMBLY TO BE PROGRAMMED	SOURCE FILE (SEE NOTE 3)	OBJECT FILE (SEE NOTE 3)	CHECKSUM

COLLIDER ACCELERATOR DEPARTMENT
BROOKHAVEN NATIONAL LABORATORY
UPTON, N.Y. 11973

TITLE:
PROGRAMMED ASSEMBLY

SIZE A   DRAWING NUMBER: 2   REV. 3

DRAWN BY / DESIGN APPROVAL / CHECKED BY / ENGINEER APPROVAL / SUPERVISOR APPROVAL

USED ON

QA CATEGORY: SCALE: WEIGHT: SHEET   OF

AUTOCAD 2000

Fig 2

5.2.4 Schematics must identify all Programmable devices with the manufacturer part number.

5.2.5 Module or Printed Board Assemblies are considered un-programmed assemblies prior to performing the instructions of the programmed assembly drawing. Once programmed, the Module or Printed Board Assembly shall be identified as per described in 5.2.3, label information.

6. Documentation

6.1 Programming instructions are to be released to the Electrical Design Group when the documentation package for a module is released.

6.2 File name of the Programmable device file (zip and pof).

- The Programmable file name shall be named using the official drawing number and revision letter as suffix to the drawing number (e.g., 2677A.zip, 2677A.pof).

6.3   When the documentation package for a module containing Programmable devices is released, full documentation for all Programmable devices used on that module shall be supplied to the Electrical Design Group via email to **cadelecdesign@bnl.gov**.

6.4   Once released, Programmable device documentation must be controlled by the Electrical Systems Design Group, and all changes shall be made by formal ECN.

7.   <u>References</u>

ASME Y14.100

8.   <u>Attachments</u>

None